4230

Instructions and Applications

Sound Level Calibrator Type 4230

A simple to use, pocket size, acoustic calibrator which gives an accurate sound pressure level of 94 dB at 1000 Hz.

BRÜEL & KJÆR

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SOUND LEVEL CALIBRATOR

TYPE 4230

WARNING

This instrument should use premium grade corrosion resistant dry cells. Low cost cells may leak and ruin the battery housing. The warranty on this instrument excludes corrosion damage from leaking dry cells.

September 1970

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1. INTRODUCTION

Type 4230 is a portable, lightweight, acoustic calibrator for accurate field calibration of sound level meters and other sound measuring systems. It fits all B & K microphones of 1 inch and 1/2 inch diameter. A unique construction gives the calibrator a high equivalent volume, and the sound pressure developed is, therefore, independent of microphone volume. This means that exact fitting of the microphone in the coupler is not critical, and that different microphones can be compared without correction for equivalent volume.

The calibrator is virtually unaffected by variations in static pressure and works accurately within a wide temperature range. The sound pressure level developed is 94 dB re 2×10^{-5} N/m^2 (1 N/m^2) and the accuracy of calibration is better than ± 0.3 dB. A frequency of 1 kHz has been chosen to give independence of the weighting networks (A, B, C and D) used with many sound level meters. These have a common reference of 1 kHz.

2. OPERATION

2.1. GENERAL

This calibrator is made for calibration of 1 inch and 1/2 inch diameter microphones. An adapter is placed in the front opening for use with 1/2 inch microphones, and is removed when 1 inch microphones are calibrated. (Fig.2.1).

To protect the Calibrator, store and operate it in its leather case.

Fig.2.1. Sound Level Calibrator Type 4230.

The sound pressure level of the calibrator is 94 dB. However, because of the increase in sound pressure at the diaphragm when a microphone is used in a free sound field, a small correction must be subtracted from this value when calibrating microphones for free field use. This correction is 0.4 dB for 1 inch microphones and 0.2 dB for 1/2 inch microphones. No correction is required when calibrating for pressure response.

Fig.2.2. Calibrator Fitted on 2205 Sound Level Meter.

2.2. PROCEDURE

1. Place the microphone into the coupler of the calibrator (Fig.2.2).
2. Press the button on the calibrator.
3. Adjust the sound level meter to read according to Table 2.1.

Pressure Response		94 dB
Free field Response	1" microphones	93.6 dB
	1/2" microphones	93.8 dB

Table 2.1. Sound pressure level in the coupler of Sound Level Calibrator 4230.

2.3. BATTERY CHANGE

If the signal does not last for at least a few seconds after the pushbutton on the calibrator has been released, then the battery needs replacing. This is done after removing the leather case by unscrewing the bottom black part of the calibrator housing (Fig.2.3), unsnapping the contacts to the battery, replacing the battery, snapping on the contacts, replacing the housing, and returning the unit to its leather case.

Fig.2.3. 9 V Battery Installed in the Calibrator.

3. DESCRIPTION

3.1. CALIBRATOR

The calibrator (Fig.3.1) is based on a 1 kHz stabilized oscillator which drives a piezoelectric bender. This bender is coupled to a membrane which produces a sound pressure in the coupler volume. As the system is adjusted to resonate at 1 kHz and is driven at this frequency, the equivalent volume is very high.

A Helmholtz resonator is built into the cavity behind the diaphragm, also tuned to 1 kHz. This minimises the effect of ambient static pressure changes on the damping produced by the internal air masses behind the diaphragm.

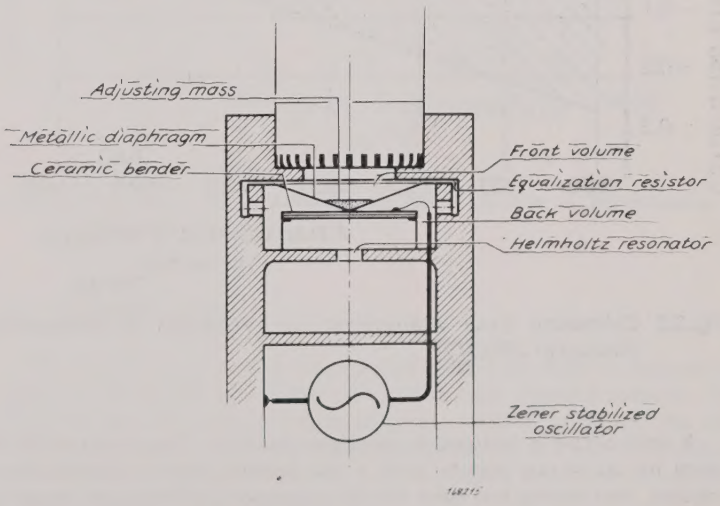

Fig.3.1. Construction of the 4230.

A built-in temperature compensation ensures accurate calibration over the entire temperature range of the calibrator. When exact error limits of a calibration are required the error adjustments shown in Figs.3.2 and 3.3 must be added to the basic ±0.25 dB uncertainty in the calibration. For example if the atmospheric pressure is only 900 mbar the error limits are ±0.30 dB at 25°C.

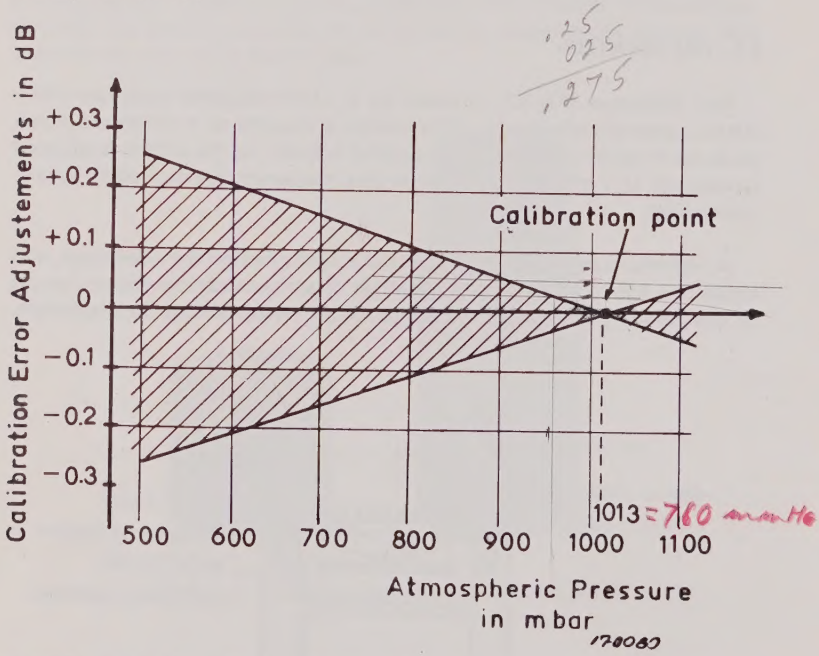

Fig.3.2. Calibration Error Adjustments for Variations in Atmospheric Pressure at 25°C.

A hold circuit is included to facilitate operation. This circuit holds the signal for up to one minute (with a new battery) after the pushbutton is released, thus leaving one hand free for adjustment of the sound measuring instrument. Short duration of the signal indicates inadequate battery power.

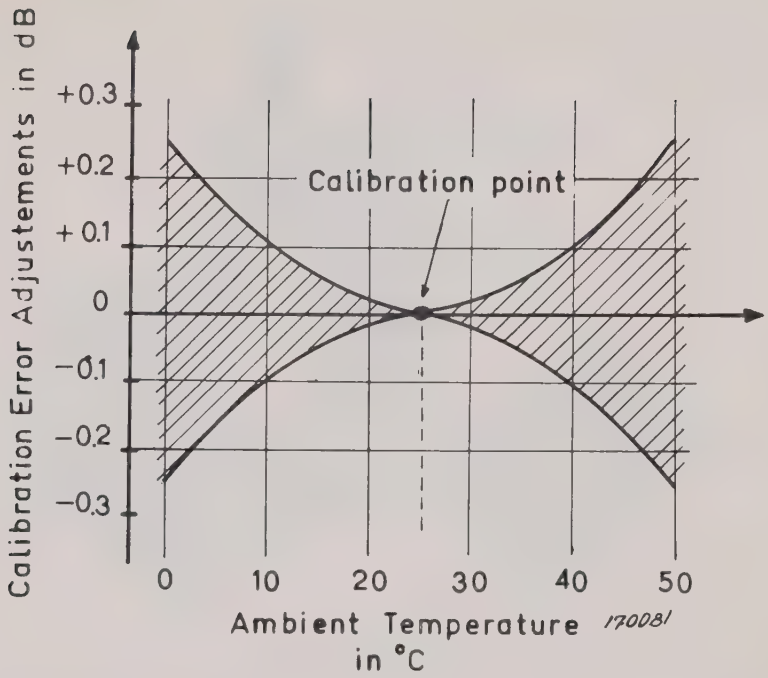

Fig.3.3. Calibration Error Adjustments for Variations in Temperature at 1013 mbar.

3.2. LEATHER CASE

The leather case which is included with the Type 4230 is designed to protect it and is best left on the unit except when changing batteries. The design of the case includes shock absorbing material to protect the calibrator if it is dropped. The case also protects against dust and the effects of instantaneous temperature changes, such as holding a cold instrument in a warm hand while doing a calibration.

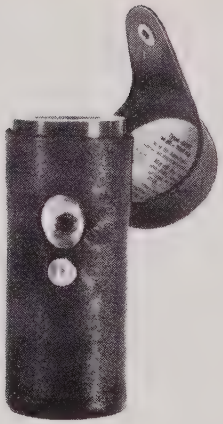

Fig.3.4. Calibrator in Its Leather Case.

4. OTHER CALIBRATION EQUIPMENT

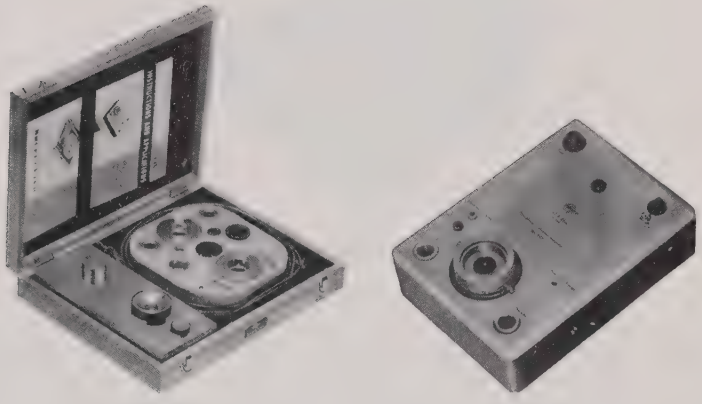

Fig.4.1. Microphone Calibration Apparatus Type 4142.

4.1. MICROPHONE CALIBRATION APPARATUS TYPE 4142

The sound Level Calibrator Type 4230 is made for field calibration of sound measuring systems. For complete calibration of condenser microphones separately with regard to both sensitivity and frequency response, the B & K Microphone Calibration Apparatus Type 4142 (Fig.4.1) may be used. This includes equipment for reciprocity calibration to a very high accuracy, and electrostatic actuators for precise determination of microphone frequency response.

4.2. PISTONPHONE TYPE 4220

The Type 4220, like the Type 4230, is a portable, battery operated cali-

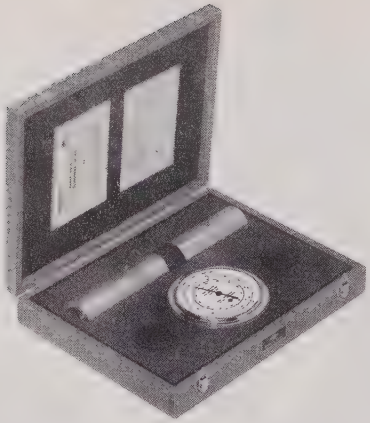

Fig.4.2. Pistonphone Type 4220.

brator suitable for calibrating entire sound systems. However, it operates at a higher sound pressure level, 124 dB ± 0.2 dB, and at a lower frequency, 250 Hz (the calibration frequency of B & K condenser microphones). The unit comes supplied with a barometer for reading ambient pressure correction and the adapters necessary for use with different size microphones. The unit is considerably heavier than the Type 4230, weighting 0.7 kg (1.54 lbs.).

5. SPECIFICATIONS

Frequency:	1 kHz ± 1.5%
Sound pressure level:	94 dB re 2 x 10^{-5} N/m^2 (1 N/m^2)
Accuracy:	± 0.25 dB at 25°C ± 0.35 dB between 10°C and 40°C ± 0.50 dB between 0°C and 50°C (Fig.3.3)
Influence of static pressure:	± 0.05 dB per 100 mbar change in pressure between 500 mbar and 1100 mbar (Fig.3.2).
Distortion:	Less than 1%
Microphone types:	1 inch and 1/2 inch
Power Supply:	Battery 1 x 9 V (IEC 6 F 22, NEDA 1604)
Battery check:	As long as the signal last for a few seconds the change in SPL is less than 0.05 dB
Dimensions including leather case:	Length 110 mm (4.40 inch) Diameter 44 mm (1.76 inch)
Weight:	260 g. (9.2 oz)
Temperature range:	0 – 50°C
Equivalent volume:	> 200 cm^3 at 25°C > 100 cm^3 between 10° and 40°C > 50 cm^3 between 0° and 50°C
Accessories Included:	1 Battery 1 leather case 1 adapter for 1/2 inch microphones

B & K INSTRUMENTS:

ACOUSTICAL....
Condenser Microphones
Piezo-Electric Microphones
Microphone Preamplifiers
Microphone Calibration Equip.
Sound Level Meters
(general purpose-precision-
and impulse)
Standing Wave Apparatus
Tapping Machines
Noise Limit Indicators

ELECTROACOUSTICAL....
Artificial Ears
Artificial Mouths
Artificial Mastoids
Hearing Aid Test Boxes
Telephone Measuring Equipment
Audiometer Calibrators
Audio Reproduction Test Equip.

STRAIN....
Strain Gauge Ap
Multipoint Panel
Automatic Select
Balancing Units

VIBRATION....
Accelerometers
Accelerometer P
Accelerometer C
Vibration Meters
Magnetic Transducers
Capacitive Transducers
Vibration Exciter Controls
Vibration Programmers
Vibration Signal Selectors
Mini-Shakers
Complex Modulus Apparatus
Stroboscopes

GENERATING....
Beat Frequency Oscillators
Random Noise Generators
Sine-Random Generators

MEASURING....
Measuring Amplifiers
Voltmeters
Deviation Bridges
Megohmmeters

ANALYZING....
ss Filter Sets
y Spectrometers
y Analyzers
Analyzers
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ter Filters
Analyzers

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y Response Tracers
Tape Recorders

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BRÜEL & KJÆR
DK-2850 Nærum, Denmark. Teleph.: (01) 80 05 00. Cable: BRUKJA, Copenhagen. Telex: 5316

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